

At birth, there are about 275 bones in the human body. In the course of development, three to five vertebrae fuse to become the sacrum, which is located in the pelvic region of the spinal cord. Four other vertebrae also fuse together, becoming the coccyx (tail-bone). In addition, many of the skull bones fuse. Thus, in the course of development the number of bones is reduced.

In the adult, the skeleton consists of 206 named bones and a variable number of unnamed sesamoid bones. The latter, most of which resemble sesame seeds, are small, rounded bones. They develop in the capsules of certain joints or in tendons, where they serve to provide support or to reduce friction. Two outstanding sesamoid bones are the kneecap (patella) and one of the wrist bones (the pisiform).

CLASSIFICATION OF BONES

Bones may be classified as long, short, flat, irregular, or sesamoid. The long bones are those of the limbs, except the wrist, ankle, and kneecap. They consist of a central long shaft (diaphysis) between two or more end regions (epiphysis) whose surface areas are jointed to (articulate with) other bones.

The so-called short bones are in the wrist and ankles. They are made of a spongy core within an outer shell of compact bone.

The flat bones include the ribs and many of the skull bones. They consist of two plates of compact material in which is sandwiched a spongy layer, technically called a diploe.

All the remaining bones are classified as irregular bones, except the patella and pisiform, which are sesamoid bones.

THE STRUCTURE, FUNCTION, AND MAINTENANCE OF BONE

A fully formed bone consists of two portions: an outer wall and an inner marrow. The outer wall, from the outside in, consists of a periosteum, a mineral layer and an endosteum.

The periosteum is a connective tissue that is fibrous and richly supplied with blood vessels. It has several essential functions. One is to anchor ligaments, tendons and fascia. A second is to transmit blood vessels into the mineral layer. Another function is to proliferate primitive bone cells (osteoblasts) during the first 21 years, enabling the bone to grow in length and breadth. The periosteum also carries out this function during adulthood in the event of a bone fracture. Osteoblasts are occasionally seen in the periosteum of a normal adult. However, it is only after a fracture – during healing and regeneration – that they appear in large numbers.

The mineral layer, or bony layer is made up of either compact bone or spongy bone that is enclosed within the compact bone of variable thickness. Compact bone is an orderly arrangement of bony sheets and tiny canals. It arises mainly after birth and consists of Volkmann's canals and Haversian systems. Volkmann's canals carry nerve fibers, blood vessels, and lymphatic vessels from the periosteum and marrow to the interspaces of the bony plates. Haversian systems run along the main axis or axes of a bone. They consist of a central canal which carries nerve fibers, blood vessels, and lymphatic vessels to bone cells. The bone cells (osteocytes) occupy tiny openings (lacunae), which occur between or within the concentric rings. A single osteocyte is found in each lacuna. Spongy bone is not as highly organized as compact bone. It is spongy in appearance, lacks Haversian systems, and its interspaces are filled with bone marrow.

The endosteum is a connective tissue that lines the cavities of the marrow and the canals of compact bone. Like the periosteum, it is important in proliferating bone cells during development or, in the case of an adult, following a fracture.

BONE MARROW

Marrow is protoplasmic material that occupies the inner cavities of bones. It receives nutrients from one or more arteries that enter the bone at an oblique angle. It sends its products, red blood cells, white blood cells, and blood platelets, into the circulation by way of veins.

The bone marrow of the entire body weighs twice as much as the body's heaviest visceral organ, the liver. Bone marrow consists of:

- supporting framework of reticular phagocytic stem cells
- sinuses
- freely moving cells within the sinuses

Until middle childhood, the marrow of all bones appears red. Throughout this period, all of the available marrow is required to provide blood cells for the developing child. Thereafter, increasing amounts of red marrow are converted into yellow marrow (adipose tissue). By the end of adolescence most of the marrow is yellow. Under stress, however, whenever blood cells are needed (i.e. certain cases of anemia), the yellow marrow may change to red marrow to produce needed blood cells. Otherwise, in the normal adult, the red marrow is located mainly in the sternum, ribs, vertebrae, and cranium.

DIVISION OF SKELETON INTO REGIONS

For convenience, the skeleton is divided into two parts: an axial skeleton and an appendicular skeleton. The axial skeleton is comprised of the skull (cranium and facial), the spinal column, the ribs and the sternum. The appendicular skeleton is composed of the upper extremities, the shoulder girdle, the lower extremities, and the pelvic girdle.

TERMS USED IN DESCRIBING IRREGULAR SURFACES ON BONES

The following terms are used to describe the processes (elevations and projections) on bones.

- Condyle – a slightly rounded projection for articulation with another bone.
- Crest – a ridge to which muscle is attached.
- Head – extends from a constricted portion (neck) to a joint.
- Pedicle – a stem, stalk, or constriction.
- Ramus – a thin process which forms an angle with the main body.
- Spine – a relatively sharp or pointed projection for muscle attachment.
- Trochanter – a large process to which muscle is attached.
- Trochlea – a process shaped like a pulley.
- Tubercle – a small, rounded projection for muscle attachment.

The following group of anatomical terms is employed to distinguish among the different types of cavities, openings, grooves, and depressions.

- Alveolus – a deep pit or socket.
- Facet – a small flat depression.
- Foramen (plural foramina) – a hole for the passage of blood vessels, nerves.
- Fossa – a depression or concavity.
- Meatus – a short canal or tube-shaped opening.
- Sinus – a space within a bone.

DISTRIBUTION OF THE 206 BONES IN THE HUMAN SKELETON

Axial Skeleton:

▪ Skull	cranium	8
	facial	14
	auditory ossicles	6
	hyoid	1
▪ Vertebrae	cervical	7
	thoracic	12
	lumbar	5
	sacral	1 (5 fused)
	coccyx	1 (3-5 fused)
▪ Thorax	sternum	1
	ribs	24

Appendicular Skeleton:

▪ Upper	shoulder girdle	4
	arms	6
	wrists	16
	hands	38
▪ Lower	pelvic girdle	2
	legs	8
	ankles	14
	feet	38

